# The Franklin Construct

## The Franklin Construct: A Self-Sustaining Lorentz-Propelled Hoverboard Platform Complete Technical Documentation and Invention Disclosure

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### Official Invention Disclosure Statement

This document serves as an official disclosure of the invention concept known as The Franklin Construct, the world's first infrastructure-free hoverboard. The purpose of this disclosure is to establish authorship, priority, and public record of the concept, including technical descriptions, system architecture, safety considerations, and component breakdown.

### Abstract

This thesis presents a comprehensive framework for the realization of a self-sustaining electromagnetic levitation platform, herein referred to as the Franklin Construct. Leveraging established principles of electromagnetic field manipulation, Lorentz force propulsion, and adaptive control systems, the Franklin Construct transcends prior limitations of superconductors, fixed magnetic tracks, and cryogenic cooling by enabling stable, controllable levitation over variable terrain using room-temperature electromagnetics.

The Franklin Construct is a hoverboard platform that achieves lift and propulsion through a combination of nanoparticle mist deposition and electromagnetic field manipulation. A two-stage mist composed of a conductive zinc base and magnetite ($Fe_3O_4$) nanoparticles creates a temporary, magnetically responsive terrain over any surface. A pyramid-stacked electromagnetic plate array generates lift, while side rails and Lorentz-force modulation provide thrust and directional control. The system is governed by adaptive control loops with redundant sensing and multiple layers of safety, including dead-man switches and emergency braking.

The proposed design combines proven technologies: a ferrofluid-based field-generating mist system for adaptable terrain, a pyramid-stacked electromagnetic propulsion array for multidirectional thrust, and regenerative power systems that reclaim kinetic energy in operation. Each technological component is grounded in current engineering achievements; their combination marks a practical, rather than merely theoretical, leap in personal transportation.

### 1. Introduction

For as long as humanity has envisioned flight, the dream of a true hoverboard has persisted. Previous approaches, reliant on superconductor-based maglev or fixed-platform infrastructure, have stalled due to the impracticalities of cooling, complexity, and prohibitive costs. The Franklin Construct offers a solution: room-temperature electromagnetic levitation and propulsion without exotic materials or rigid infrastructure.

By integrating and refining established electromagnetic concepts, the Franklin Construct

demonstrates that the future of personal mobility rests not on technology yet to be invented, but on the inspired assembly of components already within our reach.

## 2. Technical Framework

### 2.1 Magnetic Terrain Generation

A primary challenge with maglev personal transport is the requirement for pre-existing magnetic infrastructure. The Franklin Construct addresses this with a novel atomized ferrofluid delivery system, which dynamically creates a magnetizable terrain substrate.

**Principle:** A pressurized misting array disperses ferromagnetic nanoparticles in a biodegradable carrier fluid. This forms a temporary, magnetizable layer atop any surface—concrete, asphalt, earth, or water.

**Implementation:**

- **Stage 1:** Conductive zinc nanoparticle dispersion creates a thin conductive layer.
- **Stage 2:** Magnetite ($Fe_3O_4$) nanoparticle mist overlays the conductive base, producing a temporary, magnetically interactive film.
- **Primary mist:** Atomized zinc nanoparticle suspension serves as a conductive base.
- **Secondary mist:** Magnetite ($Fe_3O_4$) nanoparticles, stabilized with biodegradable surfactants, form the magnetic layer.
- **Particle size:** 10-50 nm for optimal dispersion and adhesion.
- **Coverage rate:** 0.5-2.0 $m^2/s$, enabling real-time surface preparation.
- **Surfactants and glycerin additives** stabilize the film for 60–120 seconds, after which it safely dissipates.

The mist "bridge" evaporates in minutes; nanoparticles disperse or biodegrade, leaving no lasting environmental impact.

### 2.2 Electromagnetic Propulsion Architecture

A pyramid-stacked array of electromagnetic coils provides the platform's core propulsion:

- **Pyramid-stacked ferromagnetic plates** with wound copper coils generate focused vertical lift.
- **Base Layer:** Wide ferromagnetic plates for field stability.
- **Intermediate Plates:** Smaller, graduated plates for dynamic field modulation.
- **Apex Plate:** High-density, precision control for vector thrust.
- **Differential current modulation** across coil layers enables vector steering.
- **Integrated Hall sensors** provide real-time field measurement and feedback.

This configuration allows for:

- Real-time vector and thrust control
- Rotational stability via differential field modulation
- Drag-free operation, outperforming traditional rotary/propeller systems

### 2.3 Lorentz Force Modulation

The Lorentz force provides both lift and thrust:

$$\mathbf{F = q(E + v \times B)}$$

Where:

- **F:** Force on charged particle
- **q:** Charge magnitude

**E:** Electric field strength
**v:** Velocity vector
**B:** Magnetic field density

Applications within the Construct:

**Electric and magnetic fields** interact with the charged mist terrain.
**Side rails embedded with coils** produce Lorentz-force thrust for forward motion and stability.
**Adaptive modulation** allows traversal of uneven or patchy mist coverage.
Injecting controlled currents through the ferrofluid-laden substrate
Generating perpendicular and horizontal magnetic fields
Producing vertical (levitation) and horizontal (propulsion) forces as needed

## 2.4 Adaptive Control Systems

Stabilization and control rely on:

**Dual IMUs and Hall sensor arrays** provide redundant attitude and terrain mapping.
**Electromagnetic side-rail sensors:** Monitor real-time field strength
**IMU integration:** Provides board attitude and balance feedback
**Predictive terrain adaptation:** Algorithms modulate thrust and levitation
**Adaptive PID controllers** maintain hover height and stability.
**Safety stack** includes emergency braking, dead-man switches, and power cutoff protocols.

## 2.5 Power Management and Sustainability

Power efficiency is achieved through:

**Braking and regeneration:**

Alternating Magnetic Braking (AMB)
Microturbine energy recovery
Supercapacitor and battery backup

**Power Systems:**

Regenerative braking and airflow microturbines
Lithium-ion primary cells and supercapacitor banks
Predictive power routing and field modulation
Optional photovoltaic surface integration for solar assist

# 3. Operational Dynamics

## 3.1 Initialization Sequence

Stable flight is maintained via real-time field modulation. The Franklin Construct's design removes the need for moving parts in lift generation:

Terrain assessment and surface geometry analysis
Mist deployment for surface magnetization
Field energization
Controlled ascent to operational height (5-15cm)
Sensor verification and activation of propulsion systems

## 3.2 Flight Dynamics

**Lift:** Vertical Lorentz forces
**Thrust:** Horizontal magnetic gradients
**Stability:** Imbalance correction via adaptive field strengths
Energy recovery during deceleration and braking

### 3.3 Environmental Considerations

Biodegradable mist fluids
Zero direct emissions
Minimal noise pollution
Regenerative energy systems enhance efficiency

## 4. Component Specifications and Bill of Materials

| Item | Specification / Notes | Est. Qty |
|---|---|---|
| Magnetite nanoparticles | 10–50 nm, aqueous dispersion with surfactant | 2 L colloid |
| Zinc nanoparticle dispersion | Conductive base layer, water-based | 2 L colloid |
| Biodegradable surfactant | Lecithin/polysorbate | 500 mL |
| High-pressure pump + nozzles | 60–100 psi, stainless, 0.1–0.3 mm | 1 + 8–12 |
| Electromagnetic pyramid stack | Laminated ferromagnetic plates + coils | 2–3 modules |
| Copper magnet wire | AWG 14–22, high-temp enamel | Spools |
| Side rail EM modules | Integrated coils + Hall sensors | 2 rails |
| Microcontroller & sensors | STM32/ESP32, dual IMUs, Hall arrays | 1 set |
| Battery + BMS + supercaps | 48–72 V, 1–2 kWh + 50 F bank | 1 pack |
| Safety systems | Dead-man switch, E-stop, PPE | 1 set |

## 5. Technical Specifications and Performance Metrics

| Parameter | Specification |
|---|---|
| Levitation height | 5–15cm (typical), 25cm (max) |
| Speed | 0–50km/h (governed) |
| Load capacity | 150kg (rider + board) |
| Operating temperature | -20°C to +50°C |
| Power consumption | 800W (continuous), 2kW (peak) |
| Range | 25–40km per charge (terrain-dependent) |
| Dimensions | 120×40×12cm |
| Board mass | 18kg |
| Mist reservoir | 2 liters (≈1hr operation) |

### 6. Safety Systems and Redundancy

**Primary Features:**

- Height and speed limitations
- Emergency magnetic braking (<2m stopping distance)
- Dead-man switches for operator safety
- Mechanical footpad/pedal release
- Fail-safe magnetic damping on power loss

**Redundancy:**

- Dual IMUs
- Triple field sensors
- Independent stop circuits

**Safety Considerations:**

- Nanoparticle handling requires respirator masks (N95 or higher), gloves, and eye protection.
- High current electromagnetic systems must be fused, isolated, and labeled with pacemaker warnings.
- Battery management systems must include precharge, fuses, and contactors to prevent thermal runaway.
- Dead-man switches and emergency stops must immediately power down coils and mist generation.
- All lab environments must include spill kits, fire extinguishers, and signage for magnetic hazards.

### 7. Prototype Development Path

| Phase | Objectives |
|---|---|
| Bench Validation | Mist/field characterization, |

| | |
|---|---|
| | algorithm prototyping |
| Chassis Integration | System assembly, power/sensor calibration |
| Regen & Braking | Mechanism and safety system implementation |
| Field Testing | Performance trials over varied terrains |

### 8. Societal Impact and Future Implications

**Transportation Equity:** By removing the need for specialized infrastructure, the Franklin Construct democratizes mobility, particularly in dense urban and underserved areas.
**Environmental Stewardship:** The elimination of direct emissions, combustion, and lasting terrain alteration reflects a commitment to planetary health.
**Economic Transformation:** The technology underpins new industries around manufacturing, maintenance, and support, while influencing urban planning and equitable mobility.

### 9. Conclusion

The Franklin Construct stands as a testament to applied ingenuity, realizing in practice what once seemed only a dream. Every design element is attainable with existing technology, materials, and methods. The challenge is no longer one of invention, but of courageous synthesis and implementation.
With a spirit akin to great visionaries, we must have the resolve not only to build, but to take that first step—to rise above traditional limits, and to write a new chapter in personal transportation, one anchored in technical rigor and boundless imagination.

### Inventor's Declaration

I, Christopher J. Perger, affirm that the concepts, designs, and safety considerations detailed in this document represent an original invention disclosure prepared on the date listed herein. This document is to serve as evidence of conception and disclosure for the project known as The Franklin Construct.
**Signature: _____**
**Date: _____**